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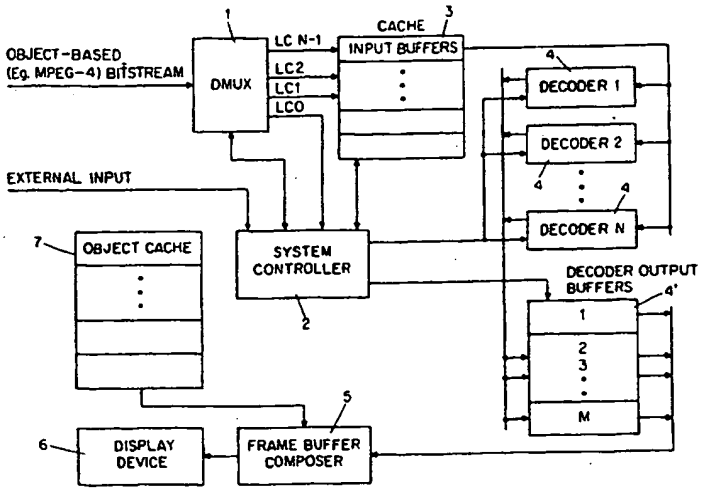


(57) Abstract

As information to be processed at an object–based video or audio–visual (AV) terminal, an object–oriented bitstream includes objects, composition information, and scene demarcation information. Such bitstream structure allows on–line editing, e.g. cut and paste, insertion/deletion, grouping, and special effects. In the interest of ease of editing, AV objects and their composition information are transmitted or accessed on separate logical channels (LCs). Objects which have a lifetime in the decoder beyond their initial presentation time are cached for reuse until a selected expiration time. The system includes a de–multiplexer (1), a controller (2) which controls the operation of the AV terminal, input buffers (3), AV objects decoders (4), buffers (4') for decoded data, a composer (5), a display (6), and an object cache (7).

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# OBJECT-BASED AUDIO-VISUAL TERMINAL AND BITSTREAM STRUCTURE

## Technical Field

This invention relates to the representation, transmission, processing and display of video and audio-visual information, more particularly of object-based information.

## Background of the Invention

Image and video compression techniques have been developed which, unlike traditional waveform coding, attempt to capture high-level structure of visual content. Such structure is described in terms of constituent "objects" which have immediate visual relevancy, representing familiar physical objects, e.g. a ball, a table, a person, a tune or a spoken phrase. Objects are independently encoded using a compression technique that gives best quality for each object. The compressed objects are sent to a terminal along with composition information which tells the terminal where to position the objects in a scene. The terminal decodes the objects and positions them in the scene as specified by the composition information. In addition to yielding coding gains, object-based representations are beneficial with respect to modularity, reuse of content, ease of manipulation, ease of interaction with individual image components, and integration of natural, camera-captured content with synthetic, computer-generated content.

## Summary of the Invention

In a preferred architecture, structure or format for information to be processed at an object-based video or audio-visual (AV) terminal, an object-oriented bitstream includes objects, composition information, and

scene demarcation information. The bitstream structure allows on-line editing, e.g. cut and paste, insertion/deletion, grouping, and special effects.

In the preferred architecture, in the interest of ease of editing, AV objects and their composition information are transmitted or accessed on separate logical channels (LCs). The architecture also makes use of "object persistence", taking advantage of some objects having a lifetime in the decoder beyond their initial presentation time, until a selected expiration time.

Brief Description of the Drawing

Fig. 1 is a functional schematic of an exemplary object-based audio-visual terminal.

Fig. 2a is a schematic of an exemplary object-based audio-visual composition packet.

Fig. 2b is a schematic of an exemplary object-based audio-visual data packet.

Fig. 2c is a schematic of an exemplary compound composition packet.

Fig. 3 is a schematic of exemplary node and scene description information using composition.

Fig. 4 is a schematic of exemplary stream-node association information.

Fig. 5 is a schematic of exemplary node/graph update information using a scene.

Fig. 6 is a schematic of an exemplary audio-visual terminal design.

Fig. 7 is a schematic of an exemplary audio-visual system controller in the terminal according to Fig. 6.

Fig. 8 is a schematic of exemplary information flow in the controller according to Fig. 7.

Detailed Description

An audio-visual (AV) terminal is a systems component which is instrumental in forming, presenting or displaying audio-visual content. This includes (but is not limited to) end-user terminals with a monitor screen and loudspeakers, as well server and mainframe computer facilities in which audio-visual information is processed. In an AV terminal, desired functionality can be hardware-, firmware- or software-implemented. Information to be processed may be furnished to the terminal from a remote information source via a telecommunications channel, or it may be retrieved from a local archive, for example. An object-oriented audio-visual terminal more specifically receives information in the form of individual objects, to be combined into scenes according to composition information supplied to the terminal.

Fig. 1 illustrates such a terminal, including a de-multiplexer (DMUX) 1 connected via a logical channel LC0 to a system controller or "executive" 2 and via logical channels LC1 through LCn to a buffer 3. The executive 2 and the buffer 3 are connected to decoders 4 which in turn are connected to a composer unit 5. Also, the executive 2 is connected to the composer unit 5 directly, and has an external input for user interaction, for example.

In the preferred AV architecture, the AV objects and their composition information are transmitted or accessed on separate logical channels. The DMUX receives the Mux2 layer from the lower layers and de-multiplexes it into logical channels. LC0 carries composition information which is passed on to the executive. The AV objects received on other logical channels are stored in the buffer to be acted upon by the

decoders. The executive receives the composition information, which includes the decoding and presentation time stamps, and instructs the decoders and composer accordingly.

The system handles object composition packets (OCP) and object data packets (ODP). A composition packet contains an object's ID, time stamps and the "composition parameters" for rendering the object. An object data packet contains an object ID, an expiration time stamp in case of persistent objects, and object data.

Preferably, any external input such as user interaction is converted to OCP and/or ODP before it is presented to the executive. There is no need for headers in a bitstream delivered over a network. However, headers are required when storing an MPEG4 presentation in a file.

Figs. 2a and 2b illustrate the structure of composition and data packets in further detail. Relevant features are as follows:

Object ID is composed of object type and object number. The default length of the Object ID is 2 bytes, including ten bits for the object number and 6 for the object type (e.g. text, graphics, MPEG2 VOP, compound object). An extensible code is used to accommodate more than 1023 objects or more than 31 object types. The following convention will be adhered to: a value of 0b111111 in the first six bits of the Object ID corresponds to 31 plus the value of the byte immediately following the ObjectID; a value of 0b11.1111.1111 in the least significant 10 bits of the Object ID corresponds to 1023 plus the value of the two bytes immediately following the Object ID (without counting the object type extension bytes, if present). The following object types

are defined:

Composition Objects (16-bit object IDs)

| | |
|---|---|
| 0X0000 | scene configuration object |
| 0X0001 | node hierarchy specification |
| 0X0002 | stream-node association |
| 0X0003 | node/scene update |
| 0X0004 | compound object |

Object Data (object type, 6 most significant bits)

| | |
|---|---|
| 0b00.0010 | text |
| 0b00.0011 | MPEG2 VOP (rectangular VOP) |

Persistent Objects (PO) are objects that should be saved at the decoder for use at a later time. An expiration time stamp (ETS) gives the life of a PO in milliseconds. A PO is not available to the decoder after ETS runs out. When a PO is to be used at a later time in a scene, only the corresponding composition information needs to be sent to the AV terminal.

Decoding Time Stamp (DTS) indicates the time an object (access unit) should be decoded by the decoder.

Presentation Time Stamp (PTS) indicates the time an object (access unit) should be presented by the decoder.

Lifetime Time Stamp (LTS) gives the duration (in milliseconds) an object should be displayed in a scene. LTS is implicit in some cases, e.g. in a video sequence where a frame is displayed for 1/frame-rate or until the next frame is available, whichever is larger. An explicit LTS is used when displaying graphics and text. An AV object should be decoded only once for use during its life time.

Expiration Time Stamp (ETS) is specified to support the notion of object persistence. An object, after it is presented, is saved at the decoder (cache) until a time given by ETS. Such an object can be used multiple times before ETS runs out. A PO with an expired ETS is no

longer available to the decoder.

Object Time Base (OTB) defines the notion of time of a given AV object encoder. Different objects may belong to different time bases. The AV terminal adapts these time bases to the local one, as specified in the MSDL VM.

Object Clock Reference (OCR) can be used if necessary to convey the speed of the OTB to the decoder. By this mechanism, OTBs can be recovered/adapted at the AV terminal.

Composition Parameters are used to compose a scene (place an object in a scene). These include displacement from the upper left comer of the presentation frame, rotation angles, zooming factors, etc.

Priority indicates the priority of an object for transmission, decoding, and display. MPEG4 supports 32 levels of priority. Lower numbers indicate higher priorities.

Persistence Indicator (PI) indicates whether an object is persistent.

Continuation Indicator (CI) indicates the end of an object in the current packet (or continuation).

Object Grouping facilitates operations to be applied to a set of objects with a single operation. Such a feature can be used to minimize the amount of composition information sent, as well as to support hierarchical scene composition based on independent sub-scenes. The composer manipulates the component objects as a group. The structure of a compound composition packet (CCP) is shown in Fig. 2c.

Bitstream Structure includes object composition packets for describing the composition and controlling the presentation of those packets, and object data packets that contain the data for the objects. A scene is composed by a set of composition packets. The

bitstream supports representation of scenes as a hierarchy by using compound composition objects (CCP), also known as node hierarchy. A CCP allows combining composition objects to create complex audio-visual scenes.

Object-Data Packet:

ObjectID - min (default) 10 bits

CI and PI could be combined:

00 - begin non-persistent

01 - begin persistent

10 - continuation

11 - end of object

Priority: 5 bits, present only if CI/PI is 0b00 or 0b01

ETS: 30 bits, present if CI/Pl is 0b01

For prediction-based video coding, VOP_type is indicated by two bits (00 (I), 01 (P), 10 (B), 11 (PB)), facilitating editing.

```
Object_data_packet{
    ObjectID                    16 bits + any extensions;
    CIPI                        2 bits
    if  (CIPI <= 1){
    Priority                    5 bits
    if (object type is MPEG VOP)
                        (any prediction based compression)
        VOP_type                    2 bits
    }
    if (CIPI == 1)
    ETS                         28  bits
    ObjectData
}
```

Object Composition Packet

```
Object_composition_packet{
    ObjectID                    16 bits + any extensions
    OCR_Flag                    1 bit
```

```
        Display_Timers_Flag          1 bit
        DTS                          30 bits
        if (OCR_Flag)
            OCR                      30 bits
        if (Display_Timers_Flag){
            PTS                      30 bits
            LTS                      28 bits
        }
        Composition_parameters;
}
```

Composition_Parameters are defined in section 2 of MSDL Verification Model, MPEG N1483, Systems Working Draft V2.0, the disclosure of which is incorporated herein by reference.

```
Composition_parameters(
    visibility                       1 bit
        composition_order            5 bits
        number_of_motion_sets        2 bits
        x_delta_0                    12 bits
        y_delta_0                    12 bits
        for  (i = 1;  i <= number_of_motion_sets; i++){
            x_delta_i                12 bits
            y_delta_i                12 bits
        }
}
```

Compound_Composition_Packet

```
Compound_composition_packet{
    ObjectID                         16 bits
    PTS                              30 bits
    LTS                              28 bits
    Composition_parameters
    ObjectCount                      8 bits
    for   (i = 0; i < ObjectCount; i++){
            Object_composition_packet;
```

```
    }
}
```

Scene Configuration Packet (SCP) is used to change reference scene width, height, to flush the buffer, and other configuration functions. The object type for SCPs is 0b00.0000. This allows for 1024 different configuration packets. The object number 0b00.0000.0000 (object ID 0X0000) is defined for use with flushing the terminal buffers.

Composition Control for Buffer Management (Object ID 0x0000)

AV terminal buffers are flushed using Flush_Cache and Scene_Update flags. When using hierarchical scene structure, the current scene graph is flushed and the terminal loads the new scene from the bitstream. Use of flags allows for saving the current scene structure instead of flushing it. These flags are used to update the reference scene width and height whenever a new scene begins. If the Flush_Cache_Flag is set, the cache is flushed, removing the objects (if any). If Scene_Update_Flag is set, there are two possibilities: (i) Flush_Cache-Flag is set, implying that the objects in the cache will no longer be used; (ii) Flush_Cache_Flag is not set, the new scene being introduced (an editing action on the bitstream) splices the current scene and the objects in the scene will be used after the end of the new scene. The ETS of the objects, if any, will be frozen for the duration of the new scene introduced. The beginning of the next scene is indicated by another scene configuration packet.

```
Scene_configuration_packet{
    ObjectID                    16 bits (OX0000)
        Flush_Cache_Flag        1 bit
```

```
Scene_Update_Flag          1 bit
if (Scene_Update_Flag){
     ref_scene_width       12 bits
     ref_scene_height      12 bits
}
}
```

Composition Control for Scene Description (Object ID 0x0001)

A hierarchy of nodes is defined, describing a scene. The scene configuration packets can also be used to define a scene hierarchy that allows for a description of scenes as a hierarchy of AV objects. Each node in such a graph is a grouping of nodes that groups the leaves and/or other nodes of the graph into a compound AV object. Each node (leaf) has a unique ID followed by its parameters as shown in Fig. 3.

Composition Control for Stream-Node Mapping (Object ID 0x0002)

As illustrated by Fig. 4, table entries associate the elementary object streams in the logical channels to the nodes in a hierarchical scene. The stream IDs are unique, but not the node IDs. This implies that more than one stream can be associated with the same node.

Composition Control for Scene Updates (Object ID 0x0003)

Fig. 5 illustrates updating of the nodes in the scene hierarchy, by modifying the specific parameters of the node. The graph itself can be updated by adding/deleting the nodes in the graph. The update type in the packet indicates the type of update to be performed on the graph.

Architectural Embodiment

The embodiment described below includes an

object-based AV bitstream and a terminal architecture. The bitstream design specifies, in a binary format, how AV objects are represented and how they are to be composed. The AV terminal structure specifies how to decode and display the objects in the binary bitstream.

AV Terminal Architecture

Further to Fig. 1 and with specific reference to Fig. 6, the input to the de-multiplexer 1 is an object-based bitstream such as an MPEG-4 bitstream, consisting of AV objects and their composition information multiplexed into logical channels (LC). The composition of objects in a scene can be specified as a collection of objects with independent composition specification, or as a hierarchical scene graph. The composition and control information is included in LC0. The control information includes control commands for updating scene graphs, reset decoder buffers etc. Logical channels 1 and above contain object date. The system includes a controller (or "executive") 2 which controls the operation of the AV terminal.

The terminal further includes input buffers 3, AV object decoders 4, buffers 4' for decoded data, a composer 5, a display 6, and an object cache 7. The input bitstream may be read from a network connection or from a local storage device such as a DVD, CD-ROM or computer hard disk. LC0 containing the composition information is fed to the controller. The DMUX stores the objects in LC1 and above at the location in the buffer specified by the controller. In the case of network delivery, the encoder and the stream server cooperate to ensure that the input object buffers neither overflow nor underflow. The encoded data objects are stored in the input data buffers until read by the decoders at their decoding time, typically given by an

associated decoding timestamp. Before writing a data object to the buffer, the DMUX removes the timestamps and other headers from the object data packet and passes them to the controller for signaling of the appropriate decoders and input buffers. The decoders, when signaled by the controller, decode the data in the input buffers and store them in the decoder output buffers. The AV terminal also handles external input such as user interaction.

In the object cache 7, objects are stored for use beyond their initial presentation time. Such objects remain in the cache even if the associated node is deleted from the scene graph, but are removed only upon the expiration of an associated time interval called the expiration time stamp. This feature can be used in presentations where an object is used repeatedly over a session. The composition associated with such objects can be updated with appropriate update messages. For example, the logo of the broadcasting station can be downloaded at the beginning of the presentation and the same copy can be used for repeated display throughout a session. Subsequent composition updates can change the position of the logo on the display. Objects that are reused beyond their first presentation time may be called persistent objects.

System Controller(SC)

The system controller controls decoding and playback of bitstreams on the AV terminal. At startup, from user interaction or by looking for a session at default network address, the SC first initializes the DMUX to read from a local storage device or a network port. The control logic is loaded into the program RAM at the time of initialization. The instruction decoder reads the instructions from the program and executes

them. Execution may involve reading the data from the input buffers (composition or external data), initializing the object timers, loading or updating the object tables to the data RAM, loading object timers, or control signaling.

Fig. 7 shows the system controller in further detail. The DMUX reads the input bitstream and feeds the composition data on LC0 to the controller. The composition data begins with the description of the first scene in the AV presentation. This scene can be described as a hierarchical collection of objects using compound composition packets, or as a collection of independent object composition packets. A table that associates the elementary streams with the nodes in the scene description immediately follows the scene description. The controller loads the object IDs (stream IDs) into object list and render list which are maintained in the data RAM. The render list contains the list of objects that are to be rendered on the display device. An object that is disenabled by user interaction is removed from the render list. A node delete command that is sent via a composition control packet causes the deletion of the corresponding object IDs from the object list. The node hierarchy is also maintained in the data RAM and updated whenever a composition update is received.

The composition decoder reads data from the composition and external data buffer and converts them into a format understood by the instruction decoder. The external input includes user interaction to select objects, disenable and enable objects and certain predefined operations on the objects. During the execution of the program, two lists are formed in the data RAM. The object list, containing a list of objects

(object IDs) currently handled by the decoders and a render list, containing the list of active objects in the scene. These lists are updated dynamically as the composition information is received. For example, if a user chooses to hide an object by passing a command via the external input, the object is removed from the render list until specified by the user. This is also how external input is handled by the system. Whenever there is some external interaction, the composition decoder reads the external data buffer and performs the requested operation.

The SC also maintains timing for each AV object to signal the decoders and decoder buffers of decoding and presentation time. The timing information for the AV objects is specified in terms of its time-base. The terminal uses the system clock to convert an object's time base into system time. For objects that do not need decoding, only presentation timers are necessary. These timers are loaded with the decoding and presentation timestamps for that AV object. The controller obtains the timestamps from the DMUX for each object. When a decoding timer for an object runs out, the appropriate decoder is signaled to read data from the input buffers and to start the decoding process. When a presentation timer runs out, the decoded data for that object is transferred to the frame buffer for display. A dual buffer approach could be used to allow writing to a frame buffer while the contents of the second buffer are displayed on the monitor. The instruction decoder can also reset the DMUX or input buffers by signaling a reset, which initializes them to the default state.

Information Flow in the Controller

Fig. 8 shows the flow of information in the controller. To keep the figure simple, the operations

performed by the instruction decoder are shown in groups. The three groups respectively concern object property modifications, object timing, and signaling.

Object Property Modifications

These operations manipulate the object IDs, also called elementary stream IDs. When a scene is initially loaded, a scene graph is formed with the object IDs of the objects in the scene. The controller also forms and maintains a list of objects in the scene (object list) and active objects in the object from the render list. Other operations set and update object properties such as composition parameters when the terminal receives a composition packet.

Object Timing

This group of operations deals with managing object timers for synchronization, presentation, and decoding. An object's timestamp specified in terms of its object time base is converted into system time and the presentation and decoding time of that object are set. These operations also set and reset expiration timestamps for persistent objects.

Signaling

Signaling operations control the over-all operation of the terminal. Various components of the terminal are set, reset and operated by controller signaling. The controller checks the decoding and presentation times of the objects in the render list and signals the decoders and presentation frame buffers accordingly. It also initializes the DEMUX for reading from a network or a local storage device. At the instigation of the controller, decoders read the data from the input buffers and pass the decoded data to decoder output buffers. The decoded data is moved to the presentation device when signaled by the controller.

WE CLAIM:

1. A method for displaying object-based audio-visual/video data, comprising:

(a) receiving, over time, a plurality of audio-visual/video objects and composition information for the objects;

(b) storing in a cache memory at least one of the objects;

(c) composing scenes from said objects including the one of the objects stored in the cache memory; and

(d) displaying the composed scenes.

2. The method of claim 1, further comprising, in addition to storing the one of the objects, storing expiration time data for the one of the objects.

3. The method of claim 1, with at least one of the objects being received from a network connection.

4. The method of claim 1, with at least one of the objects being received from local memory.

5. The method of claim 1, with at least one of the objects being received from local memory and at least one other of the objects being received from a network connection, and with the composed scenes comprising the one and the other of the objects.

6. The method of claim 1, further comprising responding to interactive user input.

7. The method of claim 6, wherein responding

comprises at least one of selecting, enabling and disenabling one of the objects.

8. Apparatus for displaying object-based audio-visual/video data, comprising:

(a) a controller circuit for controlling acquisition over time of a plurality of audio-visual/video objects and composition information for the objects;

(b) a cache memory for storing at least one of the objects;

(c) a composer circuit, coupled to the cache memory, for composing scenes from said video objects including the one of the objects stored in the cache memory; and

(d) a display for the composed scene.

9. Apparatus for displaying object-based audio-visual/video data, comprising a processor which is instructed for:

(a) controlling acquisition over time of a plurality of audio-visual/video objects and composition information for the objects;

(b) storing in a cache memory at least one of the objects;

(c) composing scenes from said video objects including the one of the objects stored in the cache memory; and

(d) displaying the composed scenes.

10. Apparatus for displaying object-based audio-visual/video data, comprising:

(a) means for controlling acquisition over time of a plurality of audio-visual/video objects and

composition information for the objects;

(b) means for for storing in a cache memory at least one of the objects;

(c) means, coupled to the cache memory, for composing scenes from said video objects including the one of the objects stored in the cache memory; and

(d) means for displaying the scene.

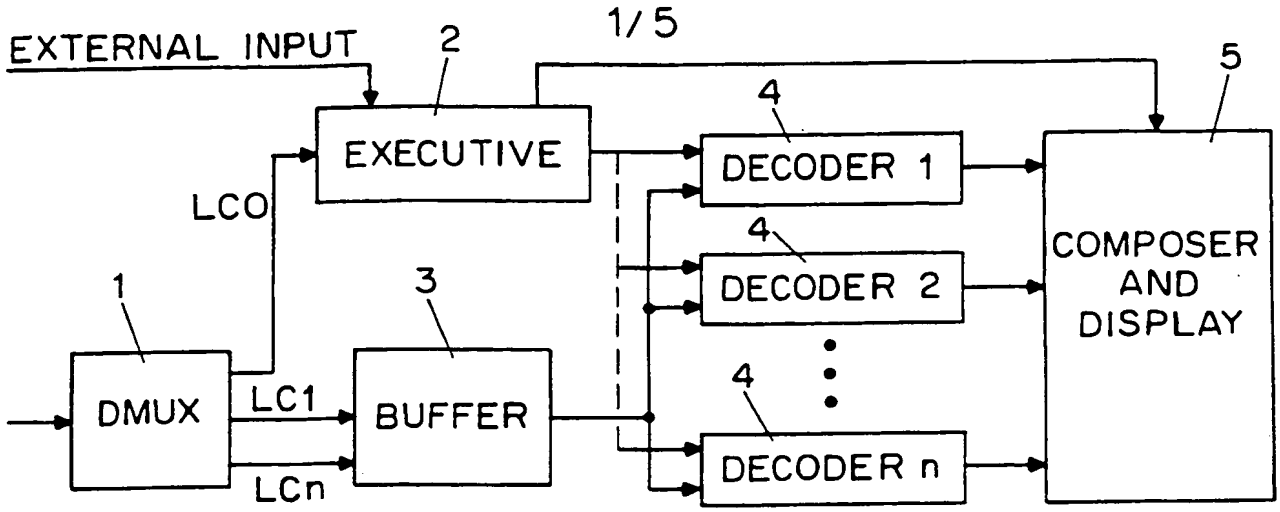


FIG. 1

| OBJECT ID |
|---|
| DTS |
| PTS |
| LTS |
| OCR |
| COMPOSITION PARAMETERS |

FIG. 2a

| COMP. OBJECT ID |
|---|
| PTS |
| LTS |
| OBJECT COUNT |
| COMPOSITION PARAMETERS |
| OBJECT ID |
| DTS |
| OCR |
| COMPOSITION PARAMETERS |

| OBJECT ID |
|---|
| CI–PI |
| PRIORITY |
| ETS |
| VOP TYPE (I, P, B) |
| OBJECT DATA |

FIG. 2b

| OBJECT ID |
|---|
| DTS |
| OCR |
| COMPOSITION PARAMETERS |

FIG. 2c

FIG. 3

FIG. 4

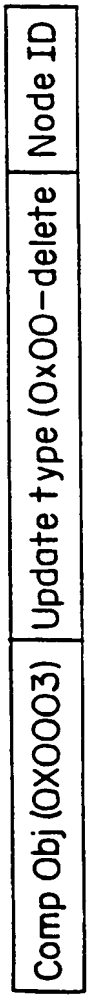

FIG. 5

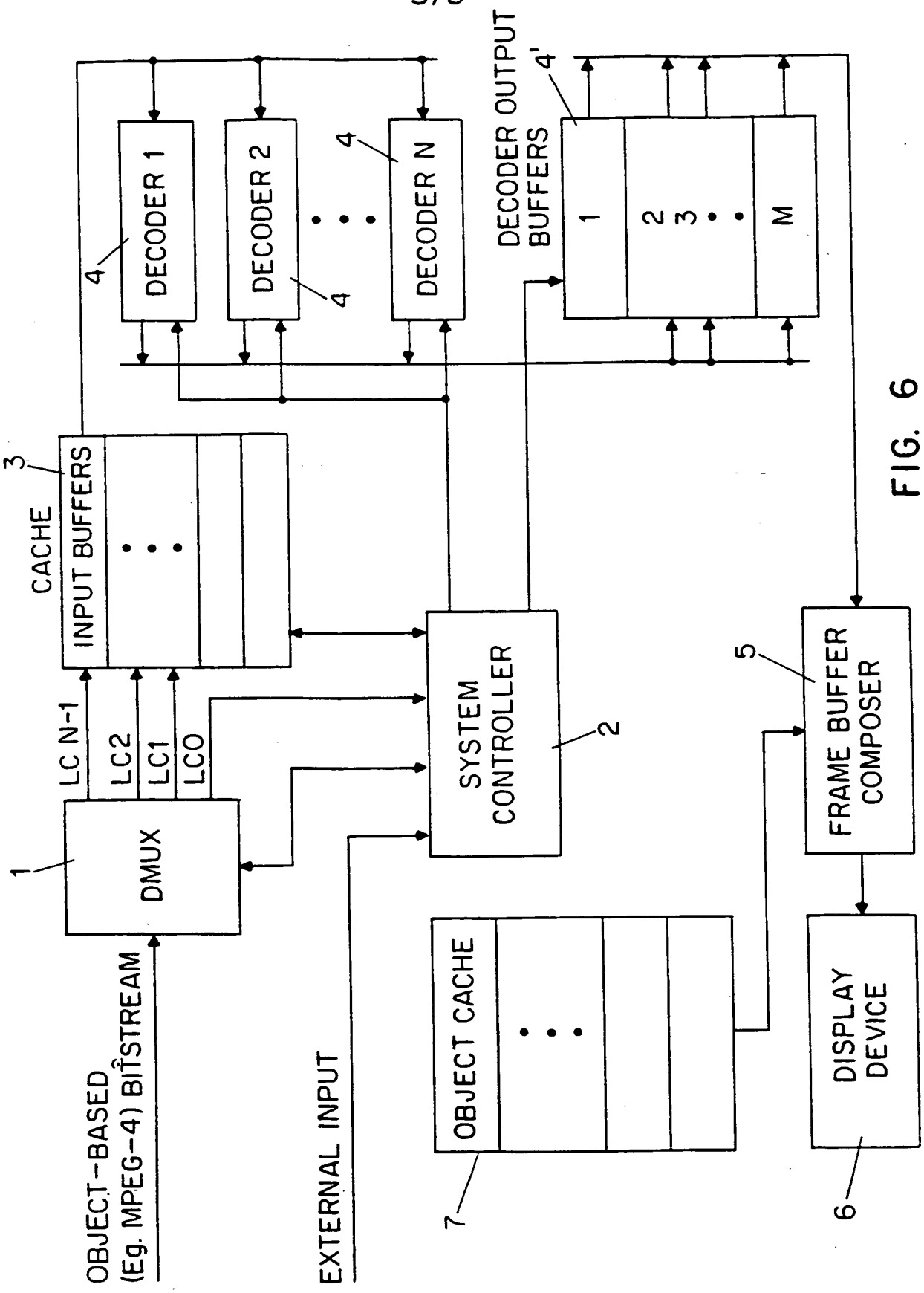
DECODER 1
DECODER 2
DECODER N
4
4
4
4'
DECODER OUTPUT BUFFERS
1
2
3
M
3
CACHE
INPUT BUFFERS
LC N-1
LC2
LC1
LCO
1
DMUX
SYSTEM CONTROLLER
2
5
FRAME BUFFER COMPOSER
OBJECT-BASED (Eg. MPEG-4) BITSTREAM
EXTERNAL INPUT
OBJECT CACHE
7
DISPLAY DEVICE
6

FIG. 6

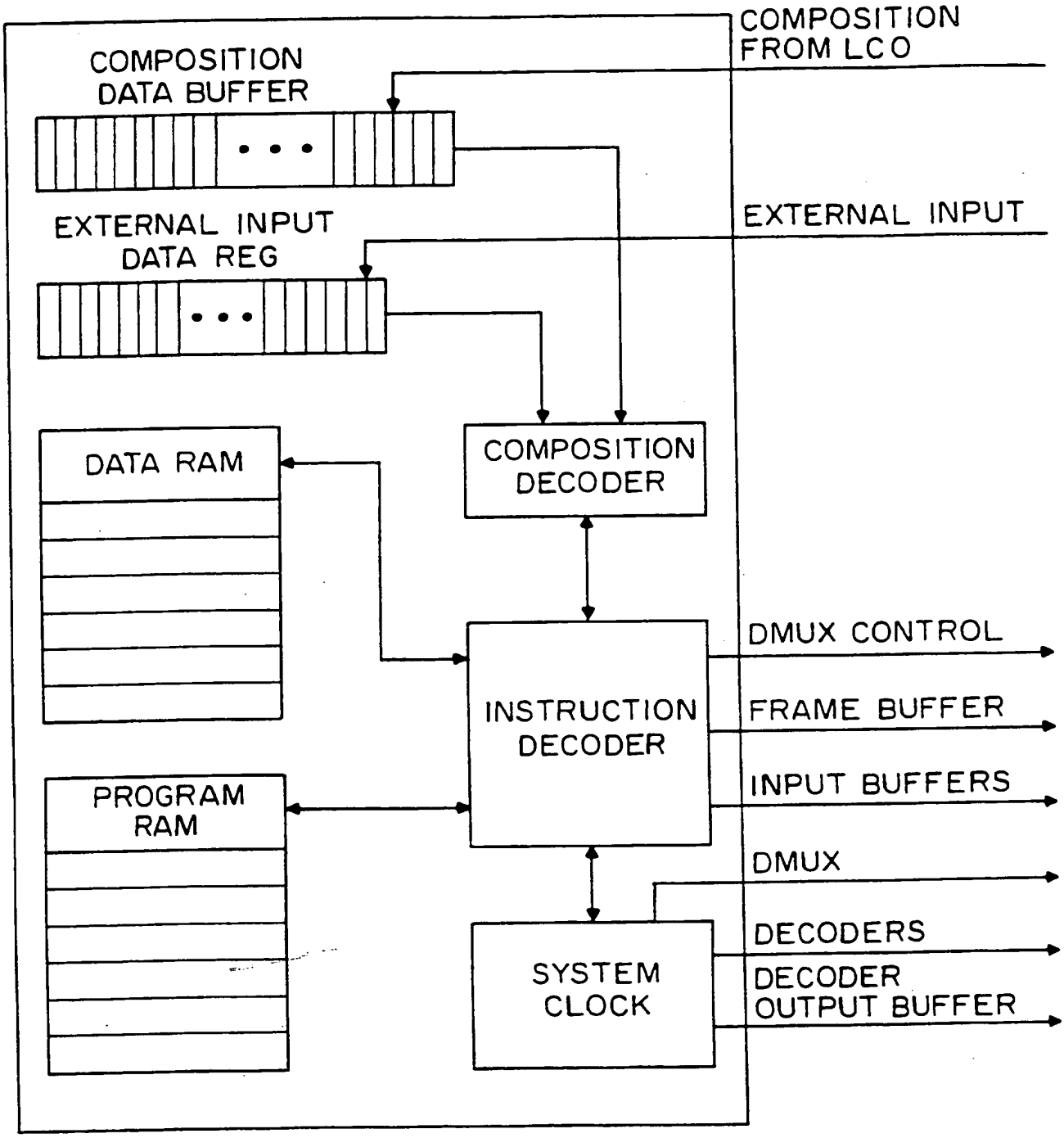
COMPOSITION FROM LCO
COMPOSITION DATA BUFFER
EXTERNAL INPUT
EXTERNAL INPUT DATA REG
DATA RAM
COMPOSITION DECODER
DMUX CONTROL
INSTRUCTION DECODER
FRAME BUFFER
INPUT BUFFERS
PROGRAM RAM
DMUX
DECODERS
SYSTEM CLOCK
DECODER OUTPUT BUFFER

FIG. 7

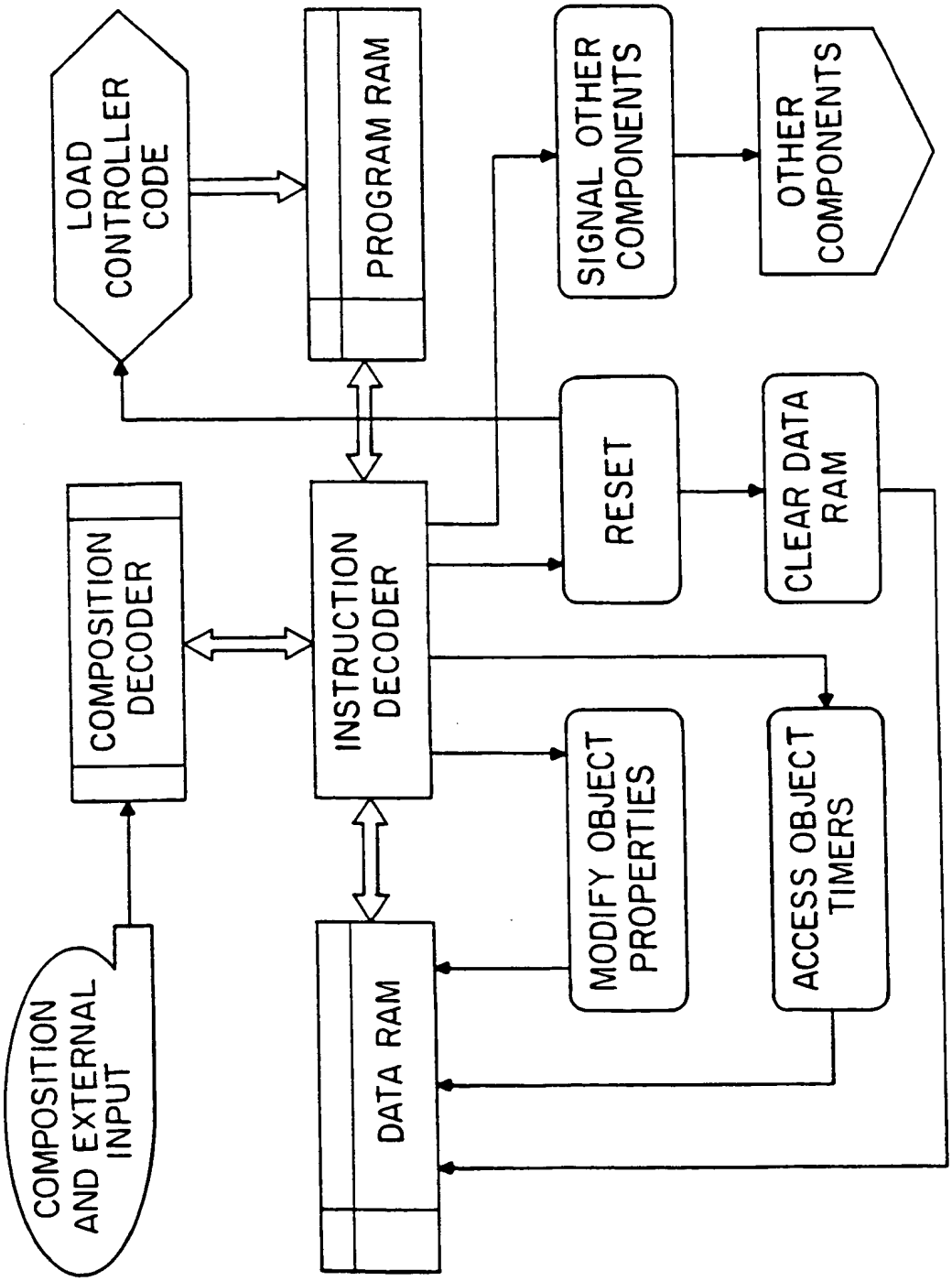
LOAD CONTROLLER CODE
PROGRAM RAM
SIGNAL OTHER COMPONENTS
OTHER COMPONENTS
RESET
CLEAR DATA RAM
COMPOSITION DECODER
INSTRUCTION DECODER
MODIFY OBJECT PROPERTIES
ACCESS OBJECT TIMERS
COMPOSITION AND EXTERNAL INPUT
DATA RAM

FIG. 8

# INTERNATIONAL SEARCH REPORT

International application No.
PCT/US98/02668

A. CLASSIFICATION OF SUBJECT MATTER
IPC(6) :H04N 5/262, 5/44, 5/60
US CL :348/722, 578, 584, 600; 345/433
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 348/722, 578, 584, 600; 345/433

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

APS

C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|---|---|---|
| X | US 5,557,342 A (ETO et al.) 17 September 1996, col. 7, lines 12-64; col. 8, lines 22-46. | 1-10 |
| X | US 5,548,346 A (MIMURA et al.) 20 August 1996, col. 4, lines 4-62, and col. 12, lines 1-60 | 1-10 |
| X | US 5,515,485 A (LUQUET et al.) 07 May 1996, col. 8, lines 26-44. | 1-10 |

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

| | | | |
|---|---|---|---|
| * | Special categories of cited documents: | "T" | later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention |
| "A" | document defining the general state of the art which is not considered to be of particular relevance | "X" | document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone |
| "B" | earlier document published on or after the international filing date | "Y" | document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art |
| "L" | document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) | "&" | document member of the same patent family |
| "O" | document referring to an oral disclosure, use, exhibition or other means | | |
| "P" | document published prior to the international filing date but later than the priority date claimed | | |

Date of the actual completion of the international search
20 APRIL 1998

Date of mailing of the international search report
27 JUL 1998

Name and mailing address of the ISA/US
Commissioner of Patents and Trademarks
Box PCT
Washington, D.C. 20231
Facsimile No. (703) 305-3230

Authorized officer
JEAN W. DESIR

Telephone No. (703) 308-9571

Form PCT/ISA/210 (second sheet)(July 1992)*

RECEIVED
BAKER & BOTTS, L.L.P.
98 JUL 31 AM 11:30

# PATENT COOPERATION TREATY

From the INTERNATIONAL SEARCHING AUTHORITY

To: HENRY TANG
BAKER & BOTTS, LLP
30 ROCKFELLER PLAZA
NEW YORK, NY 10112-0228

PCT

## NOTIFICATION OF TRANSMITTAL OF THE INTERNATIONAL SEARCH REPORT OR THE DECLARATION

(PCT Rule 44.1)

| | |
|---|---|
| Applicant's or agent's file reference<br>30919-PCT | Date of Mailing *(day/month/year)* 27 JUL 1998<br>FOR FURTHER ACTION See paragraphs 1 and 4 below |
| International application No.<br>PCT/US98/02668 | International filing date *(day/month/year)*<br>13 FEBRUARY 1998 |
| Applicant<br>THE TRUSTEES OF COLUMBIA UNIVERSITY IN THE CITY OF NEW YORK | |

1. [X] The applicant is hereby notified that the international search report has been established and is transmitted herewith.

**Filing of amendments and statement under Article 19:**
The applicant is entitled, if he so wishes, to amend the claims of the international application (see Rule 46):

**When?** The time limit for filing such amendments is normally 2 months from the date of transmittal of the international search report; however, for more details, see the notes on the accompanying sheet.

**Where?** Directly to the International Bureau of WIPO
34, chemin des Colombettes
1211 Geneva 20, Switzerland
Facsimile No.: (41-22) 740.14.35

**For more detailed instructions,** see the notes on the accompanying sheet.

2. [ ] The applicant is hereby notified that no international search report will be established and that the declaration under Article 17(2)(a) to that effect is transmitted herewith.

3. [ ] **With regard to the protest** against payment of (an) additional fee(s) under Rule 40.2, the applicant is notified that:

[ ] the protest together with the decision thereon has been transmitted to the International Bureau together with the applicant's request to forward the texts of both the protest and the decision thereon to the designated Offices.

[ ] no decision has been made yet on the protest; the applicant will be notified as soon as a decision is made.

4. **Further action(s):** The applicant is reminded of the following:

Shortly after **18 months** from the priority date, the international application will be published by the International Bureau. If the applicant wishes to avoid or postpone publication, a notice of withdrawal of the international application, or of the priority claim, must reach the International Bureau as provided in rules 90 *bis* 1 and 90 *bis* 3, respectively, before the completion of the technical preparations for international publication.

Within **19 months** from the priority date, a demand for international preliminary examination must be filed if the applicant wishes to postpone the entry into the national phase until 30 months from the priority date (in some Offices even later).

Within **20 months** from the priority date, the applicant must perform the prescribed acts for entry into the national phase before all designated Offices which have not been elected in the demand or in a later election within 19 months from the priority date or could not be elected because they are not bound by Chapter II.

| | |
|---|---|
| Name and mailing address of the ISA/US<br>Commissioner of Patents and Trademarks<br>Box PCT<br>Washington, D.C. 20231 | Authorized officer<br>JEAN W. DESIR |
| Facsimile No. (703) 305-3230 | Telephone No. (703) 308-9571 |

Form PCT/ISA/220 (January 1994)★ *(See notes on accompanying sheet)*

DOCKETED 8/7/1998 MK

RADD TO HUT PAR MCO 8/7/98

PATENT COOPERATION TREATY

# PCT

## INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

| Applicant's or agent's file reference 30919-PCT | FOR FURTHER ACTION | see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below. |
|---|---|---|
| International application No. PCT/US98/02668 | International filing date *(day/month/year)* 13 FEBRUARY 1998 | (Earliest) Priority Date 14 FEBRUARY 1997 |
| Applicant THE TRUSTEES OF COLUMBIA UNIVERSITY IN THE CITY OF NEW YORK | | |

This international search report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This international search report consists of a total of 3 sheets.

[X] It is also accompanied by a copy of each prior art document cited in this report.

1. [ ] **Certain claims were found unsearchable** (See Box I).

2. [ ] **Unity of invention is lacking** (See Box II).

3. [ ] The international application contains disclosure of a **nucleotide and/or amino acid sequence listing** and the international search was carried out on the basis of the sequence listing
   - [ ] filed with the international application.
   - [ ] furnished by the applicant separately from the international application,
     - [ ] but not accompanied by a statement to the effect that it did not include matter going beyond the disclosure in the international application as filed.
   - [ ] transcribed by this Authority.

4. With regard to the **title**,
   - [X] the text is approved as submitted by the applicant.
   - [ ] the text has been established by this Authority to read as follows:

5. With regard to the **abstract**,
   - [ ] the text is approved as submitted by the applicant.
   - [X] the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. The figure of the drawings to be published with the abstract is:

   Figure No. Fig. 6
   - [ ] as suggested by the applicant.
   - [X] because the applicant failed to suggest a figure.
   - [ ] because this figure better characterizes the invention.
   - [ ] None of the figures.

International application No.
PCT/US98/02668

Box III TEXT OF THE ABSTRACT (Continuation of item 5 of the first sheet)

## NEW ABSTRACT

As information to be processed at an object-based video or audio-visual (AV) terminal, an object-oriented bitstream includes objects, composition information, and scene demarcation information. Such bitstream structure allows on-line editing, e.g. cut and paste, insertion/deletion, grouping, and special effects. In the interest of ease of editing, AV objects and their composition information are transmitted or accessed on separate logical channels (LCs). Objects which have a lifetime in the decoder beyond their initial presentation time are cached for reuse until a selected expiration time. The system includes a de-multiplexer (1), a controller (2) which controls the operation of the AV terminal, input buffers (3), AV object decoders (4), buffers (4') for decoded data, a composer (5), a display (6), and an object cache (7).

# INTERNATIONAL SEARCH REPORT

International application No.
PCT/US98/02668

A. CLASSIFICATION OF SUBJECT MATTER

IPC(6) :H04N 5/262, 5/44, 5/60

US CL :348/722, 578, 584, 600; 345/433

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 348/722, 578, 584, 600; 345/433

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

APS

C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|---|---|---|
| X | US 5,557,342 A (ETO et al.) 17 September 1996, col. 7, lines 12-64; col. 8, lines 22-46. | 1-10 |
| X | US 5,548,346 A (MIMURA et al.) 20 August 1996, col. 4, lines 4-62, and col. 12, lines 1-60 | 1-10 |
| X | US 5,515,485 A (LUQUET et al.) 07 May 1996, col. 8, lines 26-44. | 1-10 |

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

| | | | |
|---|---|---|---|
| * | Special categories of cited documents: | "T" | later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention |
| "A" | document defining the general state of the art which is not considered to be of particular relevance | "X" | document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone |
| "E" | earlier document published on or after the international filing date | "Y" | document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art |
| "L" | document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) | "&" | document member of the same patent family |
| "O" | document referring to an oral disclosure, use, exhibition or other means | | |
| "P" | document published prior to the international filing date but later than the priority date claimed | | |

| | |
|---|---|
| Date of the actual completion of the international search<br>20 APRIL 1998 | Date of mailing of the international search report<br>27 JUL 1998 |
| Name and mailing address of the ISA/US<br>Commissioner of Patents and Trademarks<br>Box PCT<br>Washington, D.C. 20231<br>Facsimile No. (703) 305-3230 | Authorized officer<br>JEAN W. DESIR<br>Telephone No. (703) 308-9571 |

Form PCT/ISA/210 (second sheet)(July 1992)★

# NOTES TO FORM PCT/ISA/220

These Notes are intended to give the basic instructions concerning the filing of amendments under Article 19. The Notes are based on the requirements of the Patent Cooperation Treaty and of the Regulations and the Administrative Instructions under that Treaty. In case of discrepancy between these Notes and those requirements, the latter are applicable. For more detailed information, see also the PCT Applicant's Guide, a publication of WIPO.

In these Notes, "Article", "Rule" and "Section" refer to the provisions of the PCT, the PCT Regulations and the PCT Administrative Instructions, respectively.

## INSTRUCTIONS CONCERNING AMENDMENTS UNDER ARTICLE 19

The applicant has, after having received the international search report, one opportunity to amend the claims of the international application. It should however be emphasized that, since all parts of the international application (claims, description and drawings) may be amended during the international preliminary examination procedure, there is usually no need to file amendments of the claims under Article 19 except where, e.g. the applicant wants the latter to be published for the purposes of provisional protection or has another reason for amending the claims before international publication. Furthermore, it should be emphasized that provisional protection is available in some States only.

What parts of the international application may be amended ?

The claims only.

The description and the drawings may only be amended during international preliminary examination under Chapter II.

When ? Within 2 months from the date of transmittal of the international search report or 16 months from the priority date, whichever time limit expires later. It should be noted, however, that the amendments will be considered as having been received on time if they are received by the International Bureau after the expiration of the applicable time limit but before the completion of the technical preparations for international publication (Rule 46.1).

Where not to file the amendments ?

The amendments may only be filed with the International Bureau and not with the receiving Office or the International Searching Authority (Rule 46.2).

Where a demand for international preliminary examination has been/is filed, see below.

How ? Either by cancelling one or more entire claims, by adding one or more new claims or by amending the text of one or more of the claims as filed.

A replacement sheet must be submitted for each sheet of the claims which, on account of an amendment or amendments, differs from the sheet originally filed.

All the claims appearing on a replacement sheet must be numbered in Arabic numerals. Where a claim is cancelled, no renumbering of the other claims is required. In all cases where claims are renumbered, they must be renumbered consecutively (Administrative Instructions, Section 205(b)).

What documents must/may accompany the amendments ?

Letter (Section 205(b)):

The amendments must be submitted with a letter.

The letter will not be published with the international application and the amended claims. It should not be confounded with the "Statement under Article 19(1)" (see below, under "Statement under Article 19(1)").

The letter must indicate the differences between the claims as filed and the claims as amended. It must, in particular, indicate, in connection with each claim appearing in the international application (it being understood that identical indications concerning several claims may be grouped), whether

(i) the claim is unchanged;
(ii) the claim is cancelled;
(iii) the claim is new;
(iv) the claim replaces one or more claims as filed;
(v) the claim is the result of the division of a claim as filed.

# PATENT COOPERATION TREATY

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99 APR 26 AM 11:58

From the
INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

To: HENRY TANG
BAKER & BOTTS, LLP
30 ROCKFELLER PLAZA
NEW YORK, NY 10112-0228

**PCT** TO

**WRITTEN OPINION**

**(PCT Rule 66)**

| | |
|---|---|
| Date of Mailing *(day/month/year)* | 22 APR 1999 |
| Applicant's or agent's file reference: 30919-PCT | **REPLY DUE** within **TWO** months from the above date of mailing |

| International application No. | International filing date *(day/month/year)* | Priority date *(day/month/year)* |
|---|---|---|
| PCT/US98/02668 | 13 FEBRUARY 1998 | 14 FEBRUARY 1997 |

International Patent Classification (IPC) or both national classification and IPC
IPC(6): H04N 5/262, 5/44, 5/60 and US Cl.: 348/722, 578, 584, 600; 345/433

Applicant
THE TRUSTEES OF COLUMBIA UNIVERSITY IN THE CITY OF NEW YORK

1. This written opinion is the first (first, etc.) drawn by this International Preliminary Examining Authority.

2. This opinion contains indications relating to the following items:

- I [X] Basis of the opinion
- II [ ] Priority
- III [ ] Non-establishment of opinion with regard to novelty, inventive step or industrial applicability
- IV [ ] Lack of unity of invention
- V [X] Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI [ ] Certain documents cited
- VII [ ] Certain defects in the international application
- VIII [ ] Certain observations on the international application

DOCKETED
FOR 6/22/1999 BY

3. The applicant is hereby invited to reply to this opinion.

**When?** See the time limit indicated above. ~~The applicant may, before the expiration of that time limit, request this Authority to grant an extension., see Rule 66.2(d).~~

**How?** By submitting a written reply, accompanied, where appropriate, by amendments, according to Rule 66.3. For the form and the language of the amendments, see Rules 66.8 and 66.9.

**Also** For an additional opportunity to submit amendments, see Rule 66.4.
For the examiner's obligation to consider amendments and/or arguments, see Rule 66.4 *bis*.
For an informal communication with the examiner, see Rule 66.6.

**If no reply is filed**, the international preliminary examination report will be established on the basis of this opinion.

4. The final date by which the international preliminary examination report must be established according to Rule 69.2 is: 14 JUNE 1999

| Name and mailing address of the IPEA/US | Authorized officer |
|---|---|
| Commissioner of Patents and Trademarks<br>Box PCT<br>Washington, D.C. 20231 | JEAN W. DESIR |
| Facsimile No. (703) 305-3230 | Telephone No. (703) 308-9571 |

Form PCT/IPEA/408 (cover sheet) (January 1994) ★

COPY TO
HUT PAB MCU 4/27/00

WRITTEN OPINION

International application No.
PCT/US98/02668

## I. Basis of the opinion

1. This opinion has been drawn on the basis of *(Substitute sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this opinion as "originally filed".)*:

[X] the international application as originally filed.

[X] the description, pages 1-15 , as originally filed.
pages NONE , filed with the demand.
pages NONE , filed with the letter of _____.

[X] the claims, Nos. 1-10 , as originally filed.
Nos. NONE , as amended under Article 19.
Nos. NONE , filed with the demand.
Nos. NONE , filed with the letter of _____.

[X] the drawings, sheets/~~fig~~ 1-5 , as originally filed.
sheets/~~fig~~ NONE , filed with the demand.
sheets/~~fig~~ NONE , filed with the letter of _____.

2. The amendments have resulted in the cancellation of:

[X] the description, pages NONE

[X] the claims, Nos. NONE

[X] the drawings, sheets/~~fig~~ NONE

3. [ ] This opinion has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the ~~Supplemental Box~~ Additional observations below (Rule 70.2(c)).

4. Additional observations, if necessary:
NONE

WRITTEN OPINION

International application No.
PCT/US98/02668

**V. Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

1. STATEMENT

| | | | |
|---|---|---|---|
| Novelty (N) | Claims | NONE | YES |
| | Claims | 1-10 | NO |
| Inventive Step (IS) | Claims | NONE | YES |
| | Claims | 1-10 | NO |
| Industrial Applicability (IA) | Claims | 1-10 | YES |
| | Claims | NONE | NO |

2. CITATIONS AND EXPLANATIONS

*Claims 1-10* lack novelty under PCT Article 33(2) as being anticipated by Mimura et al (5,548,346).

*claim 1:*

the claimed receiving, over time, a plurality of audio-visual/video ojects and composition information for the objects is met by Fig. 11 item AV SEPARATOR.

the claimed storing in a cache memory at least one of the objects is met by col. 13 lines 3-5.

the claimed composing scenes from said objects including the one of the objects stored in the cache memory is met by Fig. 11 items 3, 66.

the claimed displaying the composed scenes is met by Fig. 11 item 5, col. 4 lines 55-62.

claim 2:

the limitation of claim 2 is inherent.

claim 3:

the limitation of claim 3 is met by Fig. 22 item 2204, col 4 lines 37-38.

claim 4:

the limitation of claim 4 is met by Fig. 11 item 12.

claim 5:

the limitation of claim 5 is met by Fig. 11 items AV SEPARATOR, 12, 3,66.

claim 6:

the limitation of claim 6 is met by Fig. 11 item 51, Fig. 17 item 51.

claim 7:

the limitation of claim 7 is inherent.

*claim 8:*

the claimed a controller circuit for controlling acquisition (Continued on Supplemental Sheet.)

**Supplemental Box**
(To be used when the space in any of the preceding boxes is not sufficient)

Continuation of: Boxes I - VIII



TIME LIMIT:

The time limit set for response to a Written Opinion may not be extended. 37 CFR 1.484(d). Any response received after the expiration of the time limit set in the Written Opinion will not be considered in preparing the International Preliminary Examination Report.

V. 2. REASONED STATEMENTS - CITATIONS AND EXPLANATIONS (Continued):
over time of a plurality of audio-visual/video ojects and composition information for the objects is met by Fig. 17 item 111, col. 4 lines 4-33.

the claimed a cache memory for storing at least one of the objects is met by col. 13 lines 3-5.

the claimed a composer circuit, coupled to the cache memory, for composing scenes from said video objects including the one of the objects stored in the cache memory is met by figs. 4, 5 col. 12.

the claimed a display for the composed scene is met by col. 4 lines 55-62.

*claim 9:*

claim 9 lacks novelty for the reasons as claim 8.

*claim 10:*

claim 10 lacks novelty for the reasons as claim 8.

---------- NEW CITATIONS ----------
NONE

*The demand must be filed directly with the competent International Preliminary Examining Authority or, if two or more Authorities are with the one chosen by the applicant. The full name or two-letter code of that Authority may be indicated by the applicant on the line*

IPEA/ US

# PCT

**CHAPTER II**

## DEMAND

under Article 31 of the Patent Cooperation Treaty:

The undersigned requests that the international application specified below be the subject of international preliminary examination according to the Patent Cooperation Treaty and hereby elects all eligible States (except where otherwise indicated).

For International Preliminary Examining Authority use only

| Identification of IPEA | Date of receipt of DEMAND |
|---|---|
| | |

**Box No. I IDENTIFICATION OF THE INTERNATIONAL APPLICATION**

Applicant's or agent's file reference: 30919-PCT

| International application No. | International filing date *(day/month/year)* | (Earliest) Priority date *(day/month/year)* |
|---|---|---|
| PCT/US98/02668 | 13 February 1998 ( 13-02-98 ) | 14 February 1997 ( 14-02-97 ) |

Title of invention
OBJECT-BASED AUDIO-VISUAL TERMINAL AND BITSTREAM STRUCTURE

**Box No. II APPLICANT(S)**

Name and address: *(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)*

THE TRUSTEES OF COLUMBIA UNIVERSITY IN THE CITY OF NEW YORK
Broadway and 116th Street
New York, NY 10027-6699
US

Telephone No.: (212) 854-8444
Facsimile No.: (212) 854-8463
Teleprinter No.:

| State *(that is, country)* of nationality: | State *(that is, country)* of residence: |
|---|---|
| US | US |

Name and address: *(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)*

ELEFTHERIADIS, ALEXANDROS
Department of Electrical Engineering
Columbia University
500 West 120th Street
New York, NY 10027-6699
US

| State *(that is, country)* of nationality: | State *(that is, country)* of residence: |
|---|---|
| GR | US |

Name and address: *(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)*

KALVA, HARI
Department of Electrical Engineering
Columbia University
500 West 120th Street
New York, NY 10027-6699
US

| State *(that is, country)* of nationality: | State *(that is, country)* of residence: |
|---|---|
| IN | US |

☐ Further applicants are indicated on a continuation sheet.

International application No.
PCT/US98/02668

## Box No. VI CHECK LIST

| The demand is accompanied by the following elements, in the language referred to in Box No. IV, for the purposes of international preliminary examination: | | | For International Preliminary Examining Authority use only: received | not received |
|---|---|---|---|---|
| 1. translation of international application | : | sheets | ☐ | ☐ |
| 2. amendments under Article 34 | : | sheets | ☐ | ☐ |
| 3. copy (or where required, translation) of amendments under Article 19 | : | sheets | ☐ | ☐ |
| 4. copy (or, where required, translation) of statement under Article 19 | : | sheets | ☐ | ☐ |
| 5. letter | : | sheets | ☐ | ☐ |
| 6. other *(specify)* | : | sheets | ☐ | ☐ |

The demand is also accompanied by the item(s) marked below:

1. ☒ fee calculation sheet
2. ☐ separate signed power of attorney
3. ☐ copy of general power of attorney; reference number, if any:
4. ☐ statement explaining lack of signature
5. ☐ nucleotide and or amino acid sequence listing in computer readable form
6. ☒ other *(specify)*: Transmittal Letter

## Box No. VII SIGNATURE OF APPLICANT, AGENT OR COMMON REPRESENTATIVE

*Next to each signature, indicate the name of the person signing and the capacity in which the person signs (if such capacity is not obvious from reading the demand).*

Peter A. Businger
Peter A. Businger (Agent)

For International Preliminary Examining Authority use only

1. Date of actual receipt of DEMAND:
2. Adjusted date of receipt of demand due to CORRECTIONS under Rule 60.1(b):
3. ☐ The date of receipt of the demand is AFTER the expiration of 19 months from the priority date and item 4 or 5, below, does not apply. ☐ The applicant has been informed accordingly.
4. ☐ The date of receipt of the demand is WITHIN the period of 19 months from the priority date as extended by virtue of Rule 80.5.
5. ☐ Although the date of receipt of the demand is after the expiration of 19 months from the priority date, the delay in arrival is EXCUSED pursuant to Rule 82.

For International Bureau use only

Demand received from IPEA on:

CHAPTER II

# PCT

## FEE CALCULATION SHEET

**Annex to the Demand for international preliminary examination**

| | |
|---|---|
| International application No. | PCT/US98/02668 |
| Applicant's or agent's file reference | 30919-PCT |

For International Preliminary Examining Authority use only

Date stamp of the IPEA

Applicant
**THE TRUSTEES OF COLUMBIA UNIVERSITY IN THE CITY OF NEW YORK**

**Calculation of prescribed fees**

| | | |
|---|---|---|
| 1. Preliminary examination fee ..... | 490.00 | P |
| 2. Handling fee *(Applicants from certain States are entitled to a reduction of 75% of the handling fee. Where the applicant is (or all applicants are) so entitled, the amount to be entered at H is 25% of the handling fee.)* ..... | 162.00 | H |
| 3. Total of prescribed fees Add the amounts entered at P and H and enter total in the TOTAL box ..... | 652.00 | TOTAL |

**Mode of Payment**

| | | | |
|---|---|---|---|
| ☐ | authorization to charge deposit account with the IPEA (see below) | ☐ | cash |
| ☒ | cheque | ☐ | revenue stamps |
| ☐ | postal money order | ☐ | coupons |
| ☐ | bank draft | ☐ | other *(specify)*: |

**Deposit Account Authorization** *(this mode of payment may not be available at all IPEAs)*

The IPEA/ US ☐ is hereby authorized to charge the total fees indicated above to my deposit account.

☒ *(this check-box may be marked only if the conditions for deposit accounts of the IPEA so permit)* is hereby authorized to charge any deficiency or credit any overpayment in the total fees indicated above to my deposit account.

| 02-4377 | 9 September 1998 | Peter A. Berniger |
|---|---|---|
| Deposit Account Number | Date *(day/month/year)* | Signature |

PATENT COOPERATION TREATY 30919-PCT

From the
INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

To:

HENRY TANG
BAKER & BOTTS, LLP
30 ROCKEFELLER PLAZA
NEW YORK NY 10112-0228

# PCT

NOTIFICATION OF RECEIPT OF DEMAND

(PCT Rule 61.1(b), first sentence and Administrative Instructions, Section 601)

Date of mailing *(day/month/year)* 13 OCT 1998

Applicant's or agent's file reference
30919-PCT

IMPORTANT NOTIFICATION

| International application No. | International filing date *(day/month/year)* | Priority date *(day/month/year)* |
|---|---|---|
| PCT/US98/02668 | 13 FEB 98 | 14 FEB 97 |

Applicant
THE TRUSTEES OF COLUMBIA UNIVERSITY IN THE CITY OF NEW YORK

1. The applicant is hereby notified that this International Preliminary Examining Authority considers the following date as the date of receipt of the demand for international preliminary examination of the international application:

09 SEP 1998

2. This date of receipt is:

RECEIVED
BAKER & BOTTS, L.L.P.
98 OCT 19 PM 3:25
TO

[X] the actual date of receipt of the demand.

[ ] the date on which the proper corrections to the demand were timely received.

3. [ ] This date is **AFTER** the expiration of 19 months from the priority date.

**Attention:** The election(s) made in the demand does (do) not have the effect of postponing the commencement of the national phase until 30 months from the priority date (or later in some Offices) (Article 39(1)). Therefore, the acts for entry into the national phase must be performed within 20 months from the priority date (or later in some Offices) (Article 22).

For details, see Annex B to Form PCT/IB/301 sent by the International Bureau and Volume II of the PCT Applicant's Guide.

[ ] This notification confirms the information given in person or by telephone on:

4. Only where paragraph 3 applies, a copy of this notification has been sent to the International Bureau.

Name and mailing address of the IPEA/US
Assistant Commissioner for Patents
Box PCT
Washington, D.C. 20231 Attn: IPEA/US
Facsimile No.

Authorized officer

Telephone No. PCT/IPEA/402

Form PCT/IPEA/402 (July 1992)

ON DOCKET FOR
10/14/99 Deadline

PCT/US98/02668

# PATENT COOPERATION TREATY

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BAKER & BOTTS, L.L.P.
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98 NOV 2 PM 12:28

From the INTERNATIONAL BUREAU

## PCT

## INFORMATION CONCERNING ELECTED OFFICES NOTIFIED OF THEIR ELECTION

(PCT Rule 61.3)

To:

TANG, Henry
Baker & Botts, LLP
30 Rockefeller Plaza
New York, NY 10112-0228
ÉTATS-UNIS D'AMÉRIQUE

| | |
|---|---|
| **Date of mailing** (day/month/year)<br>22 October 1998 (22.10.98) | |
| **Applicant's or agent's file reference**<br>30919-PCT | **IMPORTANT INFORMATION** |
| **International application No.**<br>PCT/US98/02668 | **International filing date** (day/month/year)<br>13 February 1998 (13.02.98) |
| | **Priority date** (day/month/year)<br>14 February 1997 (14.02.97) |
| **Applicant**<br>THE TRUSTEES OF COLUMBIA UNIVERSITY IN THE CITY OF NEW YORK et al | |

1. The applicant is hereby informed that the International Bureau has, according to Article 31(7), notified each of the following Offices of its election:

   EP :AT,BE,CH,DE,DK,ES,FI,FR,GB,GR,IE,IT,LU,MC,NL,PT,SE
   National :CA,JP,US

2. The following Offices have waived the requirement for the notification of their election; the notification will be sent to them by the International Bureau only upon their request:

   None

3. The applicant is reminded that he must enter the "national phase" **before the expiration of 30 months from the priority date** before each of the Offices listed above. This must be done by paying the national fee(s) and furnishing , if prescribed, a translation of the international application (Article 39(1)(a)), as well as, where applicable, by furnishing a translation of any annexes of the international preliminary examination report (Article 36(3)(b) and Rule 74.1).

   Some offices have fixed time limits expiring later than the above-mentioned time limit. For detailed information about the applicable time limits and the acts to be performed upon entry into the national phase before a particular Office, see Volume II of the PCT Applicant's Guide.

   The entry into the European regional phase is postponed **until 31 months from the priority date** for all States designated for the purposes of obtaining a European patent.

ON DOCKET FOR
10/14/99
Deadline

| | |
|---|---|
| **The International Bureau of WIPO**<br>**34, chemin des Colombettes**<br>**1211 Geneva 20, Switzerland** | Authorized officer:<br>J. Leitao |
| Facsimile No. (41-22) 740.14.35 | Telephone No. (41-22) 338.83.38 |

Form PCT/IB/332 (September 1997)

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PCT/US98/02668

30919 PCT

# PATENT COOPERATION TREATY

From the INTERNATIONAL BUREAU

## PCT

### NOTIFICATION CONCERNING SUBMISSION OF PRIORITY DOCUMENTS

(PCT Administrative Instructions, Section 411)

To:

RECEIVED
BAKER & BOTTS, L.L.P.

98 APR 14 AM 10: 39

TANG, Henry
Baker & Botts, LLP
30 Rockefeller Plaza
New York, NY 10112-0228
ETATS-UNIS D'AMERIQUE

TO DMR PHB

| | |
|---|---|
| **Date of mailing** (day/month/year)<br>31 March 1998 (31.03.98) | |
| **Applicant's or agent's file reference**<br>30919-PCT | **IMPORTANT NOTIFICATION** |

| **International application No.** | **International filing date** (day/month/year) | **Priority date** (day/month/year) |
|---|---|---|
| PCT/US98/02668 | 13 February 1998 (13.02.98) | 14 February 1997 (14.02.97) |

**Applicant**

THE TRUSTEES OF COLUMBIA UNIVERSITY IN THE CITY OF NEW YORK et al

The applicant is hereby notified of the date of receipt by the International Bureau of the priority document(s) relating to the following application(s):

| Priority application No: | Priority date: | Priority country: | Date of receipt of priority document: |
|---|---|---|---|
| 60/037,779 | 14 Feb 1997 (14.02.97) | US | 19 Mar 1998 (19.03.98) |

**The International Bureau of WIPO**
**34, chemin des Colombettes**
**1211 Geneva 20, Switzerland**

Facsimile No.: (41-22) 740.14.35

Authorized officer

F. Zotomayor

Telephone No.: (41-22) 338.83.38

Form PCT/IB/304 (July 1992)

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WO 98/36559
PCT/US98/02668

30919

# PATENT COOPERATION TREATY

From the INTERNATIONAL BUREAU

RECEIVED PCT

## PCT

**NOTICE INFORMING THE APPLICANT OF THE COMMUNICATION OF THE INTERNATIONAL APPLICATION TO THE DESIGNATED OFFICES**

(PCT Rule 47.1(c), first sentence)

To: BAKER & BOTTS, L.L.P.
TANG, Henry
Baker & Botts, LLP
30 Rockefeller Plaza
New York, NY 10112-0228
ETATS-UNIS D'AMERIQUE

98 SEP -1 PM 12:55

TO

1st

| | |
|---|---|
| **Date of mailing** (day/month/year)<br>20 August 1998 (20.08.98) | |
| **Applicant's or agent's file reference**<br>30919-PCT | **IMPORTANT NOTICE** |

| **International application No.** | **International filing date** (day/month/year) | **Priority date** (day/month/year) |
|---|---|---|
| PCT/US98/02668 | 13 February 1998 (13.02.98) | 14 February 1997 (14.02.97) |

**Applicant**
THE TRUSTEES OF COLUMBIA UNIVERSITY IN THE CITY OF NEW YORK et al

1. Notice is hereby given that the International Bureau has communicated, as provided in Article 20, the international application to the following designated Offices on the date indicated above as the date of mailing of this Notice:
   CA,EP,JP,US

   In accordance with Rule 47.1(c), third sentence, those Offices will accept the present Notice as conclusive evidence that the communication of the international application has duly taken place on the date of mailing indicated above and no copy of the international application is required to be furnished by the applicant to the designated Office(s).

2. The following designated Offices have waived the requirement for such a communication at this time:
   None

   The communication will be made to those Offices only upon their request. Furthermore, those Offices do not require the applicant to furnish a copy of the international application (Rule 49.1(a-bis)).

3. Enclosed with this Notice is a copy of the international application as published by the International Bureau on
   20 August 1998 (20.08.98) under No. WO 98/36559

### REMINDER REGARDING CHAPTER II (Article 31(2)(a) and Rule 54.2)

If the applicant wishes to postpone entry into the national phase until 30 months (or later in some Offices) from the priority date, **a demand for international preliminary examination** must be filed with the competent International Preliminary Examining Authority before the expiration of 19 months from the priority date.

It is the applicant's sole responsibility to monitor the 19-month time limit.

Note that only an applicant who is a national or resident of a PCT Contracting State which is bound by Chapter II has the right to file a demand for international preliminary examination.

### REMINDER REGARDING ENTRY INTO THE NATIONAL PHASE (Article 22 or 39(1))

If the applicant wishes to proceed with the international application in the **national phase**, he must, within 20 months or 30 months, or later in some Offices, perform the acts referred to therein before each designated or elected Office.

For further important information on the time limits and acts to be performed for entering the national phase, see the Annex to Form PCT/IB/301 (Notification of Receipt of Record Copy) and Volume II of the PCT Applicant's Guide.

COPY TO
HT 9/2

| | |
|---|---|
| **The International Bureau of WIPO**<br>**34, chemin des Colombettes**<br>**1211 Geneva 20, Switzerland** | Authorized officer<br>J. Zahra |
| Facsimile No. (41-22) 740.14.35 | Telephone No. (41-22) 338.83.38 |

Form PCT/IB/308 (July 1996) 2194216

End. in pocket

PCT/US98/02668

30919 PCT

# PATENT COOPERATION TREATY

From the INTERNATIONAL BUREAU

## PCT

### NOTIFICATION OF RECEIPT OF RECORD COPY

(PCT Rule 24.2(a))

To:

RECEIVED
BAKER & BOTTS, L.L.P

98 APR -6 AM 10: 28

TANG, Henry
Baker & Botts, LLP
30 Rockefeller Plaza
New York, NY 10112-0228
ETATS-UNIS D'AMERIQUE

TO DWR HT RAB

| Date of mailing (day/month/year) | IMPORTANT NOTIFICATION |
|---|---|
| 23 March 1998 (23.03.98) | |
| **Applicant's or agent's file reference** | **International application No.** |
| 30919-PCT | PCT/US98/02668 |

The applicant is hereby notified that the International Bureau has received the record copy of the international application as detailed below.

Name(s) of the applicant(s) and State(s) for which they are applicants:

THE TRUSTEES OF COLUMBIA UNIVERSITY IN THE CITY OF NEW YORK (for all designated States except US)
ELEFTHERIADIS, Alexandros et al (for US)

| | | |
|---|---|---|
| International filing date | : | 13 February 1998 (13.02.98) |
| Priority date(s) claimed | : | 14 February 1997 (14.02.97) |
| Date of receipt of the record copy by the International Bureau | : | 17 March 1998 (17.03.98) |
| List of designated Offices | : | |

EP :AT,BE,CH,DE,DK,ES,FI,FR,GB,GR,IE,IT,LU,MC,NL,PT,SE
National :CA,JP,US

### ATTENTION

The applicant should carefully check the data appearing in this Notification. In case of any discrepancy between these data and the indications in the international application, the applicant should immediately inform the International Bureau.

**In addition, the applicant's attention is drawn to the information contained in the Annex**, relating to:

- [X] time limits for entry into the national phase;
- [X] confirmation of precautionary designations;
- [ ] requirements regarding priority documents.

A copy of this Notification is being sent to the receiving Office and to the International Searching Authority.

ON DOCKET FOR 10/14/98

| The International Bureau of WIPO<br>34, chemin des Colombettes<br>1211 Geneva 20, Switzerland | Authorized officer:<br>J. Leitao |
|---|---|
| Facsimile No. (41-22) 740.14.35 | Telephone No. (41-22) 338.83.38 |

Form PCT/IB/301 (September 1996)

001955715

## INFORMATION ON TIME LIMITS FOR ENTERING THE NATIONAL PHASE

The applicant is reminded that the "national phase" must be entered before each of the designated Offices indicated in the Notification of Receipt of Record Copy (Form PCT/IB/301) by paying national fees and furnishing translations, as prescribed by the applicable national laws.

The time limit for performing these procedural acts is **20 MONTHS** from the priority date or, for those designated States which the applicant elects in a demand for international preliminary examination or in a later election, **30 MONTHS** from the priority date, provided that the election is made before the expiration of 19 months from the priority date. Some designated (or elected) Offices have fixed time limits which expire even later than 20 or 30 months from the priority date. In other Offices an extension of time or grace period, in some cases upon payment of an additional fee, is available.

In addition to these procedural acts, the applicant may also have to comply with other special requirements applicable in certain Offices. **It is the applicant's responsibility** to ensure that the necessary steps to enter the national phase are taken in a timely fashion. Most designated Offices do not issue reminders to applicants in connection with the entry into the national phase.

**For detailed information about the procedural acts to be performed to enter the national phase before each designated Office, the applicable time limits and possible extensions of time or grace periods, and any other requirements, see the relevant Chapters of Volume II of the PCT Applicant's Guide. Information about the requirements for filing a demand for international preliminary examination is set out in Chapter IX of Volume I of the PCT Applicant's Guide.**

GR and ES became bound by PCT Chapter II on 7 September 1996 and 6 September 1997, respectively, and may, therefore, be elected in a demand or a later election filed on or after 7 September 1996 and 6 September 1997, respectively, regardless of the filing date of the international application. (See second paragraph above.)

Note that only an applicant who is a national or resident of a PCT Contracting State which is bound by Chapter II has the right to file a demand for international preliminary examination.

## CONFIRMATION OF PRECAUTIONARY DESIGNATIONS

This notification lists only specific designations made under Rule 4.9(a) in the request. It is important to check that these designations are correct. Errors in designations can be corrected where precautionary designations have been made under Rule 4.9(b). The applicant is hereby reminded that any precautionary designations may be confirmed according to Rule 4.9(c) before the expiration of 15 months from the priority date. If it is not confirmed, it will automatically be regarded as withdrawn by the applicant. There will be no reminder and no invitation. Confirmation of a designation consists of the filing of a notice specifying the designated State concerned (with an indication of the kind of protection or treatment desired) and the payment of the designation and confirmation fees. Confirmation must reach the receiving Office within the 15-month time limit.

## REQUIREMENTS REGARDING PRIORITY DOCUMENTS

For applicants who have not yet complied with the requirements regarding priority documents the following is recalled.

Where the priority of an earlier national (i.e., national or regional) application is claimed, the applicant must submit a copy of the said national application, certified by the authority with which it was filed ("the priority document") to the receiving Office (which will transmit it to the International Bureau) or directly to the International Bureau, before the expiration of 16 months from the priority date (Rule 17.1).

Where the priority document is issued by the receiving Office, the applicant may, instead of submitting the priority document, request the receiving Office to prepare and transmit the priority document to the International Bureau. Such request must be made before the expiration of the 16-month time limit.

It is recalled that, where several priorities are claimed, the priority date to be considered for the purposes of computing the 16-month time limit is the filing date of the earliest application whose priority is claimed.

If the priority document concerned is not submitted to the International Bureau before the expiration of the 16-month time limit, or if the request to the receiving Office to transmit the priority document has not been made (and the corresponding fee, if any, paid) before the expiration of this time limit, any designated State may disregard the priority claim.

PCT

# REQUEST

The undersigned requests that the present international application be processed according to the Patent Cooperation Treaty.

For receiving Office use only

International Application No.

International Filing Date

Name of receiving Office and "PCT International Application"

Applicant's or agent's file reference *(if desired) (12 characters maximum)* 30919-PCT

**Box No. I TITLE OF INVENTION**

OBJECT-BASED AUDIO-VISUAL TERMINAL AND BITSTREAM STRUCTURE

**Box No. II APPLICANT**

Name and address: *(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (i.e. country) of residence if no State of residence is indicated below.)*

THE TRUSTEES OF COLUMBIA UNIVERSITY IN THE CITY OF NEW YORK
Broadway and 116th Street
New York, NY 10027-6699
US

☐ This person is also inventor.

Telephone No.
(212) 854-8444

Facsimile No.
(212) 854-8463

Teleprinter No.

State *(i.e. country)* of nationality:
US

State *(i.e. country)* of residence:
US

This person is applicant for the purposes of: ☐ all designated States ☒ all designated States except the United States of America ☐ the United States of America only ☐ the States indicated in the Supplemental Box

**Box No. III FURTHER APPLICANT(S) AND/OR (FURTHER) INVENTOR(S)**

Name and address: *(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (i.e. country) of residence if no State of residence is indicated below.)*

ELEFTHERIADIS, ALEXANDROS
Department of Electrical Engineering
Columbia University
500 West 120th Street
New York, NY 10027-6699
US

This person is:

☐ applicant only

☒ applicant and inventor

☐ inventor only *(If this check-box is marked, do not fill in below.)*

State *(i.e. country)* of nationality:
GR

State *(i.e. country)* of residence:
US

This person is applicant for the purposes of: ☐ all designated States ☐ all designated States except the United States of America ☒ the United States of America only ☐ the States indicated in the Supplemental Box

☒ Further applicants and/or (further) inventors are indicated on a continuation sheet.

**Box No. IV AGENT OR COMMON REPRESENTATIVE; OR ADDRESS FOR CORRESPONDENCE**

The person identified below is hereby/has been appointed to act on behalf of the applicant(s) before the competent International Authorities as: ☒ agent ☐ common representative

Name and address: *(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)*

TANG, HENRY and
BUSINGER, PETER A.
Baker & Botts, LLP
30 Rockefeller Plaza
New York, NY 10112-0228
US

Telephone No.
(212) 750-5000

Facsimile No.
(212) 750-5020

Teleprinter No.

☐ Mark this check-box where no agent or common representative is/has been appointed and the space above is used instead to indicate a special address to which correspondence should be sent.

**Continuation of Box No. III FURTHER APPLICANTS AND/OR (FURTHER) INVENTORS**

***If none of the following sub-boxes is used, this sheet is not to be included in the request.***

Name and address: *(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (i.e. country) of residence if no State of residence is indicated below.)*

KALVA, HARI
Department of Electrical Engineering
Columbia University
500 West 120th Street
New York, NY 10027-6699
US

This person is:
- ☐ applicant only
- ☒ applicant and inventor
- ☐ inventor only *(If this check-box is marked, do not fill in below.)*

State *(i.e. country)* of nationality: IN

State *(i.e. country)* of residence: US

This person is applicant for the purposes of: ☐ all designated States ☐ all designated States except the United States of America ☒ the United States of America only ☐ the States indicated in the Supplemental Box

---

Name and address: *(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (i.e. country) of residence if no State of residence is indicated below.)*

This person is:
- ☐ applicant only
- ☐ applicant and inventor
- ☐ inventor only *(If this check-box is marked, do not fill in below.)*

State *(i.e. country)* of nationality:

State *(i.e. country)* of residence:

This person is applicant for the purposes of: ☐ all designated States ☐ all designated States except the United States of America ☐ the United States of America only ☐ the States indicated in the Supplemental Box

---

Name and address: *(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (i.e. country) of residence if no State of residence is indicated below.)*

This person is:
- ☐ applicant only
- ☐ applicant and inventor
- ☐ inventor only *(If this check-box is marked, do not fill in below.)*

State *(i.e. country)* of nationality:

State *(i.e. country)* of residence:

This person is applicant for the purposes of: ☐ all designated States ☐ all designated States except the United States of America ☐ the United States of America only ☐ the States indicated in the Supplemental Box

---

Name and address: *(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (i.e. country) of residence if no State of residence is indicated below.)*

This person is:
- ☐ applicant only
- ☐ applicant and inventor
- ☐ inventor only *(If this check-box is marked, do not fill in below.)*

State *(i.e. country)* of nationality:

State *(i.e. country)* of residence:

This person is applicant for the purposes of: ☐ all designated States ☐ all designated States except the United States of America ☐ the United States of America only ☐ the States indicated in the Supplemental Box

---

☐ Further applicants and/or (further) inventors are indicated on another continuation sheet.

**Box No.V DESIGNATION OF STATES**

The following designations are hereby made under Rule 4.9(a) *(mark the applicable check-boxes; at least one must be marked):*

**Regional Patent**

☐ **AP ARIPO Patent:** **GH** Ghana, **GM** Gambia, **KE** Kenya, **LS** Lesotho, **MW** Malawi, **SD** Sudan, **SZ** Swaziland, **UG** Uganda, **ZW** Zimbabwe, and any other State which is a Contracting State of the Harare Protocol and of the PCT

☐ **EA Eurasian Patent:** **AM** Armenia, **AZ** Azerbaijan, **BY** Belarus, **KG** Kyrgyzstan, **KZ** Kazakhstan, **MD** Republic of Moldova, **RU** Russian Federation, **TJ** Tajikistan, **TM** Turkmenistan, and any other State which is a Contracting State of the Eurasian Patent Convention and of the PCT

☒ **EP European Patent:** **AT** Austria, **BE** Belgium, **CH and LI** Switzerland and Liechtenstein, **DE** Germany, **DK** Denmark, **ES** Spain, **FI** Finland, **FR** France, **GB** United Kingdom, **GR** Greece, **IE** Ireland, **IT** Italy, **LU** Luxembourg, **MC** Monaco, **NL** Netherlands, **PT** Portugal, **SE** Sweden, and any other State which is a Contracting State of the European Patent Convention and of the PCT

☐ **OA OAPI Patent:** **BF** Burkina Faso, **BJ** Benin, **CF** Central African Republic, **CG** Congo, **CI** Côte d'Ivoire, **CM** Cameroon, **GA** Gabon, **GN** Guinea, **ML** Mali, **MR** Mauritania, **NE** Niger, **SN** Senegal, **TD** Chad, **TG** Togo, and any other State which is a member State of OAPI and a Contracting State of the PCT *(if other kind of protection or treatment desired, specify on dotted line)* .....

**National Patent** *(if other kind of protection or treatment desired, specify on dotted line):*

☐ **AL** Albania .....
☐ **AM** Armenia .....
☐ **AT** Austria .....
☐ **AU** Australia .....
☐ **AZ** Azerbaijan
☐ **BA** Bosnia and Herzegovina .....
☐ **BB** Barbados
☐ **BG** Bulgaria .....
☐ **BR** Brazil .....
☐ **BY** Belarus
☒ **CA** Canada
☐ **CH and LI** Switzerland and Liechtenstein
☐ **CN** China .....
☐ **CU** Cuba .....
☐ **CZ** Czech Republic .....
☐ **DE** Germany .....
☐ **DK** Denmark .....
☐ **EE** Estonia .....
☐ **ES** Spain .....
☐ **FI** Finland .....
☐ **GB** United Kingdom
☐ **GE** Georgia .....
☐ **GH** Ghana .....
☐ **GM** Gambia
☐ **GW** Guinea-Bissau .....
☐ **HU** Hungary .....
☐ **ID** Indonesia
☐ **IL** Israel .....
☐ **IS** Iceland
☒ **JP** Japan .....
☐ **KE** Kenya .....
☐ **KG** Kyrgyzstan .....
☐ **KP** Democratic People's Republic of Korea .....
.....
☐ **KR** Republic of Korea .....
☐ **KZ** Kazakhstan .....
☐ **LC** Saint Lucia
☐ **LK** Sri Lanka
☐ **LR** Liberia
☐ **LS** Lesotho .....
☐ **LT** Lithuania
☐ **LU** Luxembourg
☐ **LV** Latvia
☐ **MD** Republic of Moldova .....
☐ **MG** Madagascar .....
☐ **MK** The former Yugoslav Republic of Macedonia .....
.....
☐ **MN** Mongolia
☐ **MW** Malawi .....
☐ **MX** Mexico .....
☐ **NO** Norway
☐ **NZ** New Zealand .....
☐ **PL** Poland .....
☐ **PT** Portugal .....
☐ **RO** Romania
☐ **RU** Russian Federation .....
☐ **SD** Sudan
☐ **SE** Sweden
☐ **SG** Singapore
☐ **SI** Slovenia .....
☐ **SK** Slovakia .....
☐ **SL** Sierra Leone
☐ **TJ** Tajikistan .....
☐ **TM** Turkmenistan .....
☐ **TR** Turkey .....
☐ **TT** Trinidad and Tobago .....
☐ **UA** Ukraine .....
☐ **UG** Uganda .....
☒ **US** United States of America .....
.....
☐ **UZ** Uzbekistan .....
☐ **VN** Viet Nam .....
☐ **YU** Yugoslavia .....
☐ **ZW** Zimbabwe .....

Check-boxes reserved for designating States (for the purposes of a national patent) which have become party to the PCT after issuance of this sheet:

☐ .....
☐ .....
☐ .....

**In addition to the designations made above,** the applicant also makes under Rule 4.9(b) all designations which would be permitted under the PCT except the designation(s) of _____. The applicant declares that those additional designations are subject to confirmation and that any designation which is not confirmed before the expiration of 15 months from the priority date is to be regarded as withdrawn by the applicant at the expiration of that time limit. *(Confirmation of a designation consists of the filing of a notice specifying that designation and the payment of the designation and confirmation fees. Confirmation must reach the receiving Office within the 15-month time limit.)*

**Box No. VI PRIORITY CLAIM** Further priority claims are indicated in the Supplemental Box ☐

The priority of the following earlier application(s) is hereby claimed:

| Country *(in which, or for which, the application was filed)* | Filing Date *(day/month/year)* | Application No. | Office of filing *(only for regional or international application)* |
|---|---|---|---|
| item (1) US | 14 February 1997 ( 14-02-97) | 60/037,779 | |
| item (2) | ( ) | | |
| item (3) | ( ) | | |

*Mark the following check-box if the certified copy of the earlier application is to be issued by the Office which for the purposes of the present international application is the receiving Office (a fee may be required):*

☒ The receiving Office is hereby requested to prepare and transmit to the International Bureau a certified copy of the earlier application(s) identified above as item(s): (1)

**Box No. VII INTERNATIONAL SEARCHING AUTHORITY**

**Choice of International Searching Authority (ISA)** *(If two or more International Searching Authorities are competent to carry out the international search, indicate the Authority chosen; the two-letter code may be used):* ISA/US

**Earlier search** *Fill in where a search (international, international-type or other) by the International Searching Authority has already been out or requested and the Authority is now requested to base the international search, to the extent possible, on the results of that earlier search. such search or request either by reference to the relevant application (or the translation thereof) or by reference to the search request:*

Country (or regional Office): Date *(day/month/year):* Number:

**Box No. VIII CHECK LIST**

This international application contains the following number of sheets:

| | | |
|---|---|---|
| 1. request | : | sheets |
| 2. description | : | sheets |
| 3. claims | : | sheets |
| 4. abstract | : | sheets |
| 5. drawings | : | sheets |
| **Total** | : | sheets |

This international application is accompanied by the item(s) marked below:

1. ☐ separate signed power of attorney
2. ☐ copy of general power of attorney
3. ☐ statement explaining lack of signature
4. ☐ priority document(s) *identified in Box No. VI as item(s):*
5. ☒ fee calculation sheet
6. ☐ separate indications concerning deposited microorganisms
7. ☐ nucleotide and/or amino acid sequence listing (diskette)
8. ☒ other *(specify):* Transmittal Letter

Figure No. _____ of the drawings (if any) should accompany the abstract when it is published.

**Box No. IX SIGNATURE OF APPLICANT OR AGENT**

*Next to each signature, indicate the name of the person signing and the capacity in which the person signs (if such capacity is not obvious from reading the request).*

Peter A. Businger

Peter A. Businger (Agent)

**For receiving Office use only**

1. Date of actual receipt of the purported international application:
2. Drawings: ☐ received: ☐ not received:
3. Corrected date of actual receipt due to later but timely received papers or drawings completing the purported international application:
4. Date of timely receipt of the required corrections under PCT Article 11(2):
5. International Searching Authority specified by the applicant: ISA/
6. ☐ Transmittal of search copy delayed until search fee is paid

**For International Bureau use only**

Date of receipt of the record copy by the International Bureau:

*This sheet is not part of and does not count as a sheet of the international application.*

# PCT

## FEE CALCULATION SHEET

**Annex to the Request**

For receiving Office use only

International application No.

Date stamp of the receiving Office

Applicant's or agent's file reference: **30919-PCT**

Applicant

**THE TRUSTEES OF COLUMBIA UNIVERSITY IN THE CITY OF NEW YORK**

### CALCULATION OF PRESCRIBED FEES

1. TRANSMITTAL FEE . . . . . **240.00** T

2. SEARCH FEE . . . . . **450.00** S

International search to be carried out by **US**

*(If two or more International Searching Authorities are competent in relation to the international application, indicate the name of the Authority which is chosen to carry out the international search.)*

3. INTERNATIONAL FEE

**Basic Fee**

The international application contains _____ sheets.

first 30 sheets . . . . . **455.00** $b_1$

**0** remaining sheets x _____ additional amount = **0.00** $b_2$

Add amounts entered at $b_1$ and $b_2$ and enter total at B . . **455.00** B

**Designation Fees**

The international application contains **4** designations.

**4** number of designation fees payable *(maximum 11)* x **105.00** amount of designation fee = **420.00** D

Add amounts entered at B and D and enter total at I . . . . . **875.00** I

*(Applicants from certain States are entitled to a reduction of 75% of the international fee. Where the applicant is (or all applicants are) so entitled, the total to be entered at I is 25% of the sum of the amounts entered at B and*

4. FEE FOR PRIORITY DOCUMENT . . . . . **15.00** P

5. TOTAL FEES PAYABLE

Add amounts entered at T, S, I and P, and enter total in the TOTAL box . . **1,580.00** TOTAL

☐ The designation fees are not paid at this time.

### MODE OF PAYMENT

| | | |
|---|---|---|
| ☐ authorization to charge deposit account (see below) | ☐ bank draft | ☐ coupons |
| ☒ cheque | ☐ cash | ☐ other *(specify)*: |
| ☐ postal money order | ☐ revenue stamps | |

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☐ is hereby authorized to charge the total fees indicated above to my deposit account.

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☐ is hereby authorized to charge the fee for preparation and transmittal of the priority document to the International Bureau of WIPO to my deposit account.

| **02-4377** | **13 February 1998** | Peter A. Brenner |
|---|---|---|
| Deposit Account Number | Date *(day/month/year)* | Signature |

# PATENT COOPERATION TREATY

From the INTERNATIONAL BUREAU

## PCT

### NOTIFICATION OF ELECTION

(PCT Rule 61.2)

To:

United States Patent and Trademark Office
(Box PCT)
Crystal Plaza 2
Washington, DC 20231
ÉTATS-UNIS D'AMÉRIQUE

in its capacity as elected Office

| | |
|---|---|
| **Date of mailing** (day/month/year)<br>22 October 1998 (22.10.98) | |
| **International application No.**<br>PCT/US98/02668 | **Applicant's or agent's file reference**<br>30919-PCT |
| **International filing date** (day/month/year)<br>13 February 1998 (13.02.98) | **Priority date** (day/month/year)<br>14 February 1997 (14.02.97) |
| **Applicant**<br>ELEFTHERIADIS, Alexandros et al | |

1. The designated Office is hereby notified of its election made:

[X] in the demand filed with the International Preliminary Examining Authority on:

09 September 1998 (09.09.98)

[ ] in a notice effecting later election filed with the International Bureau on:

2. The election [X] was

[ ] was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

| | |
|---|---|
| **The International Bureau of WIPO**<br>**34, chemin des Colombettes**<br>**1211 Geneva 20, Switzerland** | Authorized officer<br>J. Leitao |
| Facsimile No.: (41-22) 740.14.35 | Telephone No.: (41-22) 338.83.38 |